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INJURIES TO APPLE LEAVES AND FRUIT CAUSED BY SPRAY MATERIALS

In all fruit growing sections there are certain injuries caused by the use of spray materials, some of them being of more serious nature than others, but all causing a great amount of discussion among fruit growers as to the identification and cause of injuries, and preventive measures that may be taken. In Special Bulletin No. 218, issued by the Michigan Agricultural Experiment Station, Mr. W. C. Dutton gives the results of a very intensive and extensive study of spray injuries, which cover a period of several years. Many of his findings are applicable to our conditions, and therefore a resume of the above mentioned work follows, touching on those particular phases which are common to fruit growers in this state. By carefully noting in the discussion below the conditions under which injuries have resulted, and from individual experiences in his own orchard, the fruit grower may be able to clear up some mysteries of long standing. Furthermore, mistakes in dilutions used may be more carefully avoided, and some note made of weather conditions prevailing at the time spraying is being done.

Lime-Sulphur Burn

Lime-sulphur when applied on the foliage of the apple may cause a definite burn which causes the death of the injured portions of the leaf. These areas become brown. They may be small and scattered over the leaf or they may be large and of irregular form. Large injured areas are often marginal or at the tip of the leaf, but in cases of severe injury entire leaves are killed. This type of injury is most common during midsummer but often occurs with petal-fall or early summer applications, and even with the delayed dormant, prepink and pink application. When injured from delayed dormant and prepink applications it is likely to take the form of tip-burn and the injured portions of the small, partly developed leaves turn brown or simply dry out without browning. In more severe cases the entire small leaves may be killed and blossom-bud development checked. Lime-sulphur injuries usually become evident within one to four days after the spray has been applied.

Injury by high wind is often confused with lime-sulphur burn. Wind injury, however, is usually localized in that portion of the tree directly toward the wind, or the portions of the orchard most exposed. The injured areas are usually not so well defined as those resulting from lime-sulphur.

Wind injury most frequently occurs in the early summer when the leaves are tender.

FACTORS AFFECTING LIME-SULPHUR BURN

Temperature

In general the higher the temperature the greater the danger of lime-sulphur burn. Lime-sulphur used at the rate of 2½ gallons in 100 gallons of spray caused every severe injury to foliage when the temperature at the time of the application was 89° F. and rose to 94° F. during the afternoon. The same material when applied a day or two earlier or later when temperatures were much lower caused no trouble.

In another experiment lime-sulphur applied one afternoon at 75° F. caused no injury while that applied the following afternoon at 85° F. caused noticeable injury. In still another case cited, lime-sulphur at several concentrations was applied to apple foliage with temperatures of 97° F. and no injuries developed; it is probable that the lack of injury with this very high temperature was due to the hardening effect on the foliage of extreme dry weather that had prevailed for some time and to the very low relative humidity prevailing when applied. Therefore, though the development of lime-sulphur burn often occurs with high temperatures, other conditions are nessessary for burning to develop.

Humidity and Rate of Drying

During the petal-fall application, material applied on one day with moderate temperature but high humidity caused considerable lime-sulphur burn. On succeeding days the humidity was lower and no injury resulted. In one instance the weather was fair, temperature ranged from 45° to 48° F., there was a moderate wind and the spray dried quickly, no injury followed. At another time temperature ranged from 37° to 40° F., there was some precipitation in the form of light rain and sleet, the spray dried very slowly, the trees were wet for more than an hour and severe injury followed.

Injury developing under these conditions may be severe but usually is not so extensive as that occurring with high temperatures. Slow drying at high temperatures will give severe injury while if the spray material dries in five minutes or less at high temperatures it is almost impossible to produce lime-sulphur injury.

Condition of the Foliage

Observations over a period of several years indicate that young leaves and those developed during periods of relatively low temperature, high humidity, and with the amount of sunlight below normal, are more susceptible to lime-sulphur injury if hardening has not occurred, than laves that have been hardened by age, or by high temperature, low humidity and much sunlight. There are, therefore, two conditions with regard to the foliage itself which affects the amount of injury. Tender foliage seems to make injury possible when other factors are only moderately favorable for its development, and hardened foliage makes injury much less likely to develop even though other factors may be favorable.

No definite rule can be stated as to what concentration of lime-sulphur will burn and what will not because of the many other factors that influence the development of injury.

Misshaping of Leaves

Lime-sulphur injury to fully developed apple leaves usually does not produce any misshaping of the leaf. If, however, partly grown leaves are injured, misshaping almost always follows.

Marginal injury to such leaves cause them to assume many unusual forms as a result of the checking of the growth at the margin while growth continues at the central portion of the leaf. Slow drying, at rather low temperatures, and tender foliage were the factors favoring injury in one instance.

Dwarfing

The young leaves, especially those that develop from blossom buds are often dwarfed, crinkled and blistered. Frost in the pre-blossom period and spraying materials used in that period are factors of importance in the development of the trouble. Leaf development is sometimes checked by the too frequent and too heavy application of lime-sulphur, especially at a relatively high concentration. (Strong solutions.)

In a few instances, very serious injuries have followed the excessive use of lime-sulphur and lead arsenate. The most conspicuous instance was in an orchard where trees were sprayed three times before the blooming period and three times soon after blooming with lime-sulphur, 3 gallons, lead arsenate, 6 pounds in 100 gallons. This spray was applied so heavy that the leaves at all times were heavily coated with spray residue. This resulted in checking the growth of leaves, in much actual injury so that the leaves were ragged in appearance, and in heavy leaf-fall during mid-summer. This injury also resulted in an excessive June drop of fruit and severe russeting and cracking of the remaining fruits.

Apple Scab and Lime-Sulphur Injury

Injury has often been reported as a result of lime-sulphur penetrating leaf-tissues through deep-seated scab spots. This condition has been observed many times. This injury is an effectual check to further development of scab spots so affected but heavy leaf-fall may occur if the leaves are badly infected with scab, then burned by lime sulphur. The same type of injury may follow the use of other materials, also, as lead arsenate, alone or with lime-sulphur, Bordeaux and sometimes arsenical dusts.

Secondary Effects of Lime-Sulphur Injury

Fruit-set has not been affected under normal conditions, but under certain unusual conditions the set of fruit has been reduced. Heavy application, frequent application, high concentration, spraying heavily from under the trees, and severe lime-sulphur burn in the petal-fall or in the two-weeks applications are factors that may cause an excessive loss of fruit in the June drop.

Severe or moderate amounts of injury to foliage often affects unfavorably the formation of blossom buds and may also result in reducing the

fruit set.

The premature dropping of fruit just before the harvest period is often greater and the size of the fruit may be affected unfavorably where considerable foliage injury has occurred.

Color development in apples on trees that have suffered moderate to severe foliage injury is usually checked. The ground color is likely to remain green and the red does not develop fully.

Growth of wood, determined by measurements of annual rings, is checked where the leaf area has been reduced by spray injury.

Arsenical Injury ("Yellow Leaf" Injury)

The initial stage of this injury is purple or reddish spots on the leaf; but, usually, the first stage observed is a brown spot at some point on the leaf or larger and usually irregular areas that are marginal or at the tip of the leaf. It is difficult, in many cases, if not impossible, to distinguish between certain stages of arsenical injury and lime-sulphur injury. Many leaves with these brown areas persist until normal leaf fall but large numbers of them yellow and drop early.

(To Be Continued)

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FOR AND AGAINST THE MOTOR TRUCKS

(From October, 1932 *Mountineer Grower*, W. Va. State Horticultural Society)

Good Points

1. Widens consumption of apples, by direct appeal more frequently made to housewife or handler by trucker.

2. Enables towns not able to handle carlots to receive apples more frequently.

3. Dealer or housewife can inspect for self fruit being sold. (May mean decreased call for inspection service at origin).

4. Means great increase cash transactions. Lessens losses from shyster, defaulting or otherwise "gyp" buyers and handlers.

5. Reduces sales cost, as it eliminates in many cases selling organization, its charge and brokerages. (Where driver is "salesman" for the load, or where truckers come in and buy at orchard.)

6. Lessens handling into and from car, and cost thereof; avoids building bulkheads or slatting. Allows for unloading at purchaser's business site.

7. Gives overnight marketing; lessens chance of loss from market fluctuations; avoids refrigeration costs. Avoids delivery delays or lost or strayed cars.

8. Gives necessary competition for railroads, forcing betterment of service at lower rates.

9. Usually cheaper.

Bad Points

1. Unknown, unpredictable arrivals. Upsets established dealers demands. Dealers fear to order in carload, as trucks liable to arrive and fill demand.

2. Ungraded, low-grade and cull fruit too frequently place in direct competition with growers graded, high-class fruit, by trucks coming into wholesale or retail markets or by house to house canvass. Poor fruit helps pull down market for good fruit.

3. Unskilled salesmen (truck drivers), knowing little or nothing of price-levels in the town or possible prices, do the selling in many cases; driven by need of getting home.

4. Immediate unload necessary, in place of hold-over, with demurrage, in carlots.

5. No inspection used on fruit bought by truckers and marketed by them; nor by growers marketing own by truck, in most cases. Some growers marking poor packs, uninspected, as U. S. ONE, and trucking to market, to sell alongside the inspected, good fruit of decent growers.

6. Limits field of distribution. Tends to throw too much fruit within limited area—say 200 mile circle around producing belt—making surplus and market glut that tends to establish price.

7. No reports on supplies en route or arrived at any one market available now for truck movement.

8. Putting low-grade, faulty apples into public's hands lessens their liking for apples; bad advertisement.

* * *

This country was all right while we only tried to keep up with the Joneses—the trouble began when we tried to pass them.

* * *

In a publication entitled "Summary of the Apple Export Season, 1931-32" by F. A. Motz, Bulletin F. S. A-434, issued by the Foreign Agricultural Service Division, U. S. Bureau of Agricultural Economics, Washington, D. C. (August 1932) a very complete account of the fruit market in foreign countries in 1931-32 season is to be found. The export activities of American apples, pears, plums, peaches and grapes are described. It would be impossible to condense this 52 page bulletin, but there are some points brought out, regarding condition of fruit, proper packing, grading, and shipment, that apply as well to our local and domestic markets as to the export trade.

In the foreign boxed apple market, the general rule follows, that if a shipment of poorly-colored, wasty, or over-ripe fruit gets on the market, the whole boxed apple market suffers a price set-back. Sometimes, condition of fruit rather than supplies, governs the market. There are trade preferences for variety as well as for color. Some buyers who re-export American fruit from England to other countries, are not strong for yellow apples, yet if they see some yellow fruit of unusual merit, they buy it and seem to sell it nicely, even though their markets are not favorable to a

particular variety or color.

In the barrelled trade, the buyers are usually wary of early fruit unless it is really good. The English market wants good color, and to prove this, there is the statement that Williams Early Red Apples, well-colored brought $3.04 more per barrel than other poorly-colored apples of the same grade and variety. Transparent apples arrived in London and Liverpool during 1931 on July 20. Small-sized, green, immature and tasteless, hot, split, soft and wasty—that's the way it is described. This fruit was not sent from Maryland, but we wonder if there was some Maryland Transparent that was not exported but that reached local markets in about the same condition.

The report repeatedly brings out the point that European markets are developing a demand for better grades and the best varieties. They don't buy heated, over-ripe, fruit very readily and if they do, there is little profit for the grower. It appears, too, that refrigerated ship storage is the best policy, if fruit is to arrive in good condition. And here's another point to consider: the buyers over there have likes and dislikes toward certain growers' fruit and in some cases, states and districts are singled out as good or bad fruit shippers.

Baskets are gaining favor only slowly, but the Trabox made a good impression on the 1931 export market.

The Europeans are going in for more athletics and fruit is becoming more popular in the diet. They have their "Eat More Fruit" campaigns over there, too. Mr. Motz states, "At no time has American fruit been more widely and favorably known throughout Europe than it is today. The standardization of the American pack has perhaps done more than anything else to develop and extend markets. The United States is generally recognized as a leader, both as regards uniform packing and as a producer of high quality fruit. Competing countries frequently stencil their packages "American Packing". During the past few years, American shippers have succeeded in reaching the most out-of-the-way markets and the wide distribution can rightly be regarded as nothing short of phenomenal . . . . . There is every reason to believe that Europe will continue to draw upon America for supplies, but, if we read the signs aright, the time has come when it will pay to export only the best."

Low grade, immature, scalded fruit, poorly graded, arriving in slack or broken boxes and barrels comes in for a share of discussion. The practice of using shredded oil paper is recommended for scald control in barrelled fruit exported late in the fall. In connection with the use of the oil paper, the report states that many barrels arrived overseas with oil paper on the face of the barrel. Other barrels range from 4 ounces up to the full 1½ pounds of paper necessary for scald control. This is false economy and buyers cut heavily on such fruit. The use of either purple or deep red colored paper seems best, as green paper is likely to detract from the red color or the yellow color of fruit.

The comments on pears are similar to those regarding apples. The condition of the pears upon arrival in Europe is the factor to be considered by shippers, and such fruit should be shipped in refrigeration.

The likes and dislikes of the market will apply almost as equally to American markets as to those of Europe.

A cable from London on October 13, 1932, stated that American fruit, both apples and pears, was arriving in generally good condition and on a favorable market. Canadian fruit arriving at the same time was arriving overripe and showing some decay. Apparently our growers are doing a better job of grading and packing, this year, and we are going to hold our valuable export trade. The more fruit that we can export at a good price, the less fruit we will have to sell in the United States, and the better domestic market we will have.

* * *

TIMING CODLING MOTH SPRAYS

Under the old "hootch pail" system of trying to find the dates of emergence of codling moth, pails of fermenting cider or sugar or syrup solutions were hung in the tops of apple trees, and the number of codling moths which were attracted and drowned, were counted daily. This was a rather uncertain method, as there was little indication of how large a number of moths were out laying eggs. Last year Maryland Spray Service workers used a different method. Corrugated paper bands, taken from trees and containing hundreds of codling moths in winter cocoons were put into screen cages in late fall. These cages were then placed in orchards in various parts of the State, and the daily emergence of moths was counted in the spring. Sprays were timed accordingly by the Maryland Spray Service and the growers did a good job of stopping the first brood of codling moth.

The following poem was written recently by Mr. F. M. Wadley, of the U. S. Bureau of Entomology, and dedicated as an ode to the Maryland Spray Service, with apologies to Mr. P. D. Sanders.

REDUCE THE INSECT TAX

When times are hard and sales are lax,
Much greater looms the insect tax;
The codling moth takes greater share
Than growers think is right or fair.

In winter, this persistent pest
On apple bark in silken nest
Is found. In spring the moths come out,
And lay their eggs on trees about.

Worms from these eggs will fruit attack;
From apples we can turn them back
With poison spray. In timing well
The secret of success we tell.

In fall the worms, in cages stored,
With corrugated paper board,
In paper cells will spin their nests
And there pass through their winter rests.

These cages placed 'mid orchard trees,
Exposed to sun and shower and breeze,
Are watched in spring with daily care
To note the transformation there.

The data thus secured will serve
To plot the moth emergence curve.
This is a newer, better way,
Gives warning of the time to spray.

Thus with the insect, growers wise
Their spraying work will synchronize.
Results are better, we are told,
Than with fixed spray dates used of old.

So, better fruit without more cost,
And less in cull piles to be lost,
Less worms, more apples we can stand,
And better times in Maryland.

HERE'S NEWS

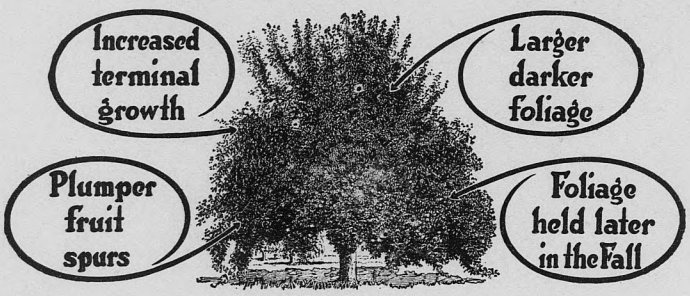
"American Hortigraphs", October, 1932 tells us that Washington State's apple crop returns annually about 32 million dollars to the growers. In 1931, more than 45,000 cars were shipped from that state. If 3 trains of 40 cars each, left the state every day in the year, there would still be 1200 cars of apples left for shipment at the end of the year. Washington has 5% of the apple trees of the country and produces about 28% of the commercial crop. According to these figures one out of every four apples eaten raw, comes from Washington's orchards.

KEEP IT UP

The Maryland "Market News Letter", November 1, 1932, reports that while tonnage of apples inspected to date has been about 50% of last year, the general quality of fruit was improved and a higher percentage was meeting U. S. No. 1 grade and being certified.

A NEW MAGAZINE

A new magazine, "The Farmer-Salesman", has appeared in the mail. It is designed for the roadside-market grower, and published monthly. Those interested in looking it over should write for sample copy. Address The Farmer-Salesman, 817 Exchange Avenue, Chicago, Ill.



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